

## Authors' response to reviewer

We are glad to see that most of our answers to the points raised in the previous round of evaluation were found satisfactory by the reviewer. We are thankful to receive further guidance on how to improve the manuscript “The Linear Link: Deriving Age-Specific Death Rates from Life Expectancy” submitted for publication in the MDPI journal Risks. The time and effort dedicated to providing feedback on our manuscript are appreciated. The new changes in the manuscript are highlighted within the manuscript. We also took advantage of this second round of reviews to update our results and figures with the most recent HMD data. The changes are insignificant, and the conclusion and discussion remain in the same line. Please see below, in blue, our response to your comments and concerns.

### Open Review

( ) I would not like to sign my review report

(x) I would like to sign my review report

English language and style

( ) Extensive editing of English language and style required

( ) Moderate English changes required

( ) English language and style are fine/minor spell check required

(x) I don't feel qualified to judge about the English language and style

	Yes	Can be improved	Must be improved	Not applicable
Does the introduction provide sufficient background and include all relevant references?	(x)	( )	( )	( )
Is the research design appropriate?	(x)	( )	( )	( )
Are the methods adequately described?	( )	(x)	( )	( )
Are the results clearly presented?	( )	(x)	( )	( )
Are the conclusions supported by the results?	( )	(x)	( )	( )

Comments and Suggestions for Authors

The manuscript was improved, and the Authors followed most of my suggestions.

Although, in my opinion, authors should make two changes:

-study mortality in poor-data countries examples

- describe situations or countries where life expectancy at birth is known but not death rates.

**Authors' response:** During the 20<sup>th</sup> and 21<sup>st</sup> century significant progress has been made in collecting and analyzing vital statistics in most of the countries around the world. However, even nowadays one can encounter regions and countries (e.g. in Sub-Saharan or central Asia areas) that are deficient at this aspect making it impossible to accurately track the evolution of the life expectancy at birth or age-specific death rates. National and international agencies (like the United Nations or WHO) usually make use of indirect estimation methods heavily based on expert judgment to determine demographic indicators and compensate for the lack of data. Relational models where one indicator (e.g. life expectancy of the population) is based on another (e.g.

survival rates in a specific age range) are common. Our method, discussed in the manuscript, intends to provide a new solution within this framework i.e. the transition for a life expectancy measure to an age specific mortality pattern. We understand that the method alone cannot represent a solution in all these types of regions however, in the hands of the right country specialist capable of making an educated guess on life expectancy and borrow information from populations with identical characteristics and good quality data the advantages of the Linear-Link method are obvious.

We have included the following paragraphs in the discussion section to better inform the reader about the limitations of the method:

*[line 216] Future work is currently envisioned to apply and compare the proposed Linear-link with other approaches in contexts of lower data quality or availability.*

*[line 243 or 248] There are two limitations of our proposed approach that should be mentioned: (i) its dependency on age-specific mortality information, which is needed to estimate the model's parameters, and (ii) the accuracy of such information. The former is particularly relevant for countries with deficient or lack of data, and it can be overcome by borrowing information from neighboring regions, as in the spirit of model life tables. The latter is more generally shared by any methodology that aims at modeling and forecasting mortality age-patterns.*

Submission Date 27 July 2020

Date of this review 26 Sep 2020 11:59:13

Date of Authors' response: 30 Sep 2020